RADA PULSER, SR.
~~5070B~~
5070-B
ISSUE B

KAY ELEMETRICS CORP

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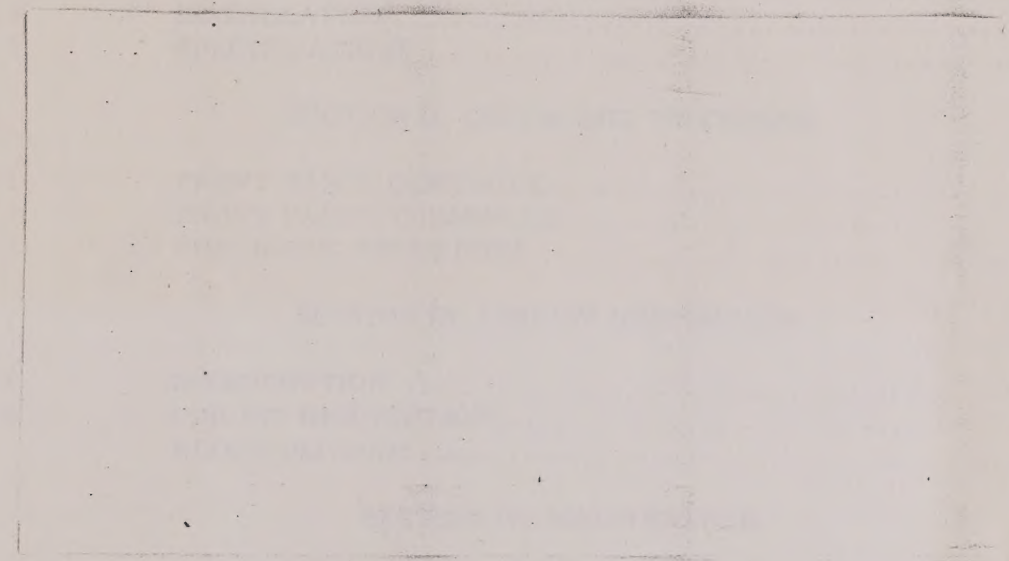
INSTRUCTION MANUAL
ISSUE B

DECEMBER 1967



RADA-PULSER, SR.
5070-B

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SECTION I

GENERAL INFORMATION

1.1 INTRODUCTION

The Rada-Pulser Sr. 5070-B is a fully transistorized pulsed-carrier generator; it provides sharp rise and decay times and flat tops. You can obtain pulsed r-f, video pulses, or c-w output from this instrument. The pulse widths are continuously variable from 100 ns to 100 μs, and the repetition rate can be varied from 50 to 5000 pps.

The pulsed r-f output is generated by an oscillator which is controlled by a pulse generator with a diode switch. The r-f output is held at the same peak levels during either c-w or pulsed r-f operation. The carrier pulses are flat (including overshoot) within $\pm$5% and the rise and decay times are less than 10 ns. The output level can be varied to a maximum of 0.5 volt rms into 50 ohms. The carrier-off level is greater than 70 db (to 85 db) below the carrier level, within the normal frequency range of the instrument. The diode switch, in addition to being driven by the internal pulse generators, can be driven by any external source. An input pulse of approximately 2 volts will trigger the 5070-B, in either pulsed-carrier or video-pulse mode. The video-pulse generator provides the same range of pulse width as the pulsed carrier, and width rise and decay times of less than 20 ns. In this function, you can obtain a maximum output of $\pm$3 volts into a 50-ohm load. A sync pulse is available which precedes the output by 40 ns.

During c-w operation, the 5070-B will generate a signal, continuously variable, from 10 to 120 mc in five overlapping bands. A 101 db step attenuator is included in the instrument enabling comparative output measurements to be made on an oscilloscope. The unit also has a variable gain control, having a range of 6 db, providing a continuous range of attenuation. The output amplitude during c-w is monitored by a front-panel meter.

1.2 INSTALLATION

Unpacking: Upon receipt of the instrument, visually inspect it for any damage that might have occured during shipment. Please report any damage to the carrier and to the Kay Electric Company.

Installation: Designed as a bench top unit, the 5070-B may be removed from its cabinet and be mounted in a standard 19 inch relay rack. The electronically regulated power supply operates from 117 VAC line voltage.

Operating Notes: The 5070-B is designed for general use, in an environment reasonably constant in temperature and humidity. Adequate air circulation is provided by the cabinet's ventilating grating, as long as it is not obstructed. In any test operation using this instrument, impedance matching devices should be used where input and output impedances differ substantially. Also, the exclusive use of coaxial or shielded cabling and connectors will prevent stray pick-up.

1.3 SPECIFICATIONS

Frequency Range: 10 to 120 mc with a direct reading dial in 5 overlapping ranges. Dial accuracy is ±1%.

Output Amplitude: CW - 0.5V rms into 50 ohms;
Pulsed R-F Carrier Level - 0.5V into 50 ohms;
Video Pulse - ±3V peak into 50 ohms;

Carrier-Off Level: 85 db to 30 mc, 80 db to 70 mc, 70 db to 120 mc.

Pulsed Carrier Rise & Decay Times: Less than 10 ns.

Video Pulse Rise & Decay Times: Less than 20 ns.

Pulse Repetition Rate: 50 pps to 5000 pps.

Pulse Width: 100 ns to 100 μs.

Attenuator: 101 db in 1 db steps plus approximately 6 db variable.

Sync Output: 2.5V peak into a high impedance with 20 ns rise time.
Sync pulse precedes the output pulse by approx. 40 ns.

External Trigger Input: Approximately a -2V pulse.

Power Supply: 117V ±10%, 50-60 cps. Power consumption approx. 30W.
All supply voltages electronically regulated.

SECTION II

CHECK OUT PROCEDURE

2.1 FRONT PANEL CONTROLS

CONTROL	POSITION	FUNCTION
Selector Switch	OFF	The unit is completely shut off.
	CW	A c-w signal is available at the PULSE or RF OUT jack.
	PULSED RF	A pulsed carrier is available at the PULSE or RF OUT jack.
	+ VIDEO PULSE	A +3 volt video pulse is available at the PULSE or RF OUT jack.
	- VIDEO PULSE	A -3 volt video pulse is available at the PULSE or RF OUT jack.
Frequency Selector	COARSE	Selects either frequency range or external oscillator input.
	FINE	Enable continuous tuning of the desired band.
RF OR PULSE LEVEL	Variable	Provides variable attenuation of CW, PULSED RF, or VIDEO PULSE output. Range is approximately 6 db.
PULSE RATE	EXT MOD	A positive pulse of about 2 volts will turn the pulsed rf on; zero volts will shut it off. The input impedance is nominally 50 ohms, and the circuitry is d-c coupled permitting the use of extremely long pulses. The external modulation controls both the repetition rate and width of the pulsed carrier.
	EXT TRIGGER	Permits external control of the pulse repetition rate only. It requires approximately a -2 volt pulse for triggering.
	50 - 500 500 - 5 kc	These positions select the range of pulse repetition rates. The RATE ADJ control permits full variation.
PULSE WIDTH	.1 - 1.0 μs 1.0 - 10 μs 10 - 100 μs	These positions select the range of pulse widths. The WIDTH ADJ control permits full variation.
Attenuator	Switchable	Provides 101 db of attenuation in 1 db steps.

2.2 FRONT PANEL TERMINALS

TERMINAL	FUNCTION
EXT OSC	Permits the use of an external oscillator, when the Frequency Selector is in the EXT OSC position. This jack presents an impedance of 50 ohms; signals from 5 to 130 mc at .35 volts rms may be used. When not in use, the external oscillator should be removed.
EXT MOD	Permits the use of external modulation, when the PULSE RATE switch is in the EXT MOD position.
EXT TRIGGER	Permits the use of external triggering, when the PULSE RATE switch is in the EXT TRIGGER position.
SYNC OUT (Pos)	Provides a high-impedance sync pulse output. The pulse is +2.5 volts peak, and has a rise time of approximately 20 ns.
PULSE OR RF OUT (50 ohm)	Supplies c-w, pulsed rf, or video pulses into a 50 ohm load.

2.3 CHECK OUT PROCEDURE

A. FREQUENCY RANGE

1. Place the FUNCTION SELECTOR in the CW position.
2. Use a frequency counter to check that the dial accuracy is within ±1% over the entire range of the unit.

B. PULSE RATES

1. Connect the PULSE or RF OUT jack to an oscilloscope making sure that the cable used is 50 ohm cable and that it is terminated at the scope in 50 ohms.
2. Switch to a VIDEO PULSE position, place the PULSE RATE switch in the 50 to 500 pps position and check to see that the oscilloscope indicates this range.
3. Place the PULSE RATE switch in the 500 to 5000 pps position and check to see that the oscilloscope indicates this range.

C. EXTERNAL INPUTS

1. Place the FUNCTION SELECTOR in the EXT MOD position.
2. Connect the output of a pulse generator to the EXT MOD jack and provide pulses of +2 volts peak.
3. See that the rate and width are both externally controlled.
4. Place the PULSE RATE switch in the EXT TRIGGER position and feed in pulses to the EXT TRIGGER jack.
5. See that the pulse rate is controlled by the external trigger input and the pulse width by the PULSE WIDTH and WIDTH ADJ controls.

D. VIDEO PULSES

1. Check each video pulse position for the following: pulse rate, pulse width, amplitude, rise and fall time, and pulse overshoot.
2. Consult the alignment procedure for corrective measures if any pulse characteristic does not meet specifications.

SECTION III

CIRCUIT DESCRIPTION

3.1 INTRODUCTION

This section contains information on how the 5070-B functions electrically. This description will be useful when the operator is making operational checks of the instrument or is trouble-shooting it to find a particular malfunction.

3.2 CIRCUIT DESCRIPTION

The first stage of the pulse generator is an astable multivibrator whose repetition rate is variable from about 50 cps to 5000 cps in two ranges, each range using different timing capacitors, but the same potentiometers for controlling repetition rate. This followed by a pulse amplifier to sharpen the rise and fall times of the Repetition Rate Multivibrator and to act as a buffer. The pulse is then differentiated through a diode-capacitor network and fed to the Pulse Width Multivibrator. The Pulse Width Multivibrator is a monostable multivibrator. The width of the quasi-stable state is variable from 100 ns to 100 μs in the ranges of 100 ns to 1μs, 1 μs to 10 μs, and 10 μs to 100 μs, each range using a different timing capacitor but the same potentiometer for controlling pulse width. This multivibrator may be triggered by an external source.

The Pulse Width Multivibrator is followed by a pulse amplifier to sharpen the rise and fall times of the pulse. This is followed by another pulse amplifier supplying more power while sharpening the rise and fall times and controlling the amplitude of the pulse. This amplifier may be controlled by an external modulation. The Sync Out amplifier is a pulse amplifier and preceeds the Pulse Width Multivibrator. It supplies a positive 2.5 volt spike of about 10 ns rise time and preceeds the pulse or r-f output by about 40 N Sec.

Carrier Oscillator and Isolation Amplifiers

The carrier oscillator is a transistorized push-pull oscillator producing a large and stable waveform with low distortion. The oscillator is variable from 10 mc to 120 mc in five overlapping ranges. This is followed by two emitter followers, isolating the oscillator from the rest of the circuitry, so that the frequency sill remain stable and the output level constant.

AGC

The AGC Detector is a diode doubler and monitors the RF level at the isolation stages. The RF voltage is detected at this point, amplified through high gain DC amplifiers and controls the oscillator level by varying the bias voltages on the oscillator. This also aids in stabilizing frequency and reducing distortion.

Diode Switch and Driver

The diode switch is a balanced diode modulator consisting of two sets of diode networks, so that the pulsed RF will be of equal amplitude above and below ground level. The switch receives the RF from the second isolation emitter follower and is gated on and off by the diode switch driver which receives a signal from the pulse generator.

Output Amplifiers

The output of the diode switch is fed into a potentiometer which continuously adjust the RF level over a 6 db range. The signal now feed into the first RF amplifier which supplies about 10 db voltage gain. The signal now goes into an emitter follower to provide the necessary power gain. In the dideo pulse operation, the signal is switched to a video pulse amplifier to provide the necessary power out. The CW, Pulsed RF or Video Pulse then passes through a 101 db attenuator to the PULSE or RF OUT jack. The output of the emitter follower is detected and displayed on the front panel meter.

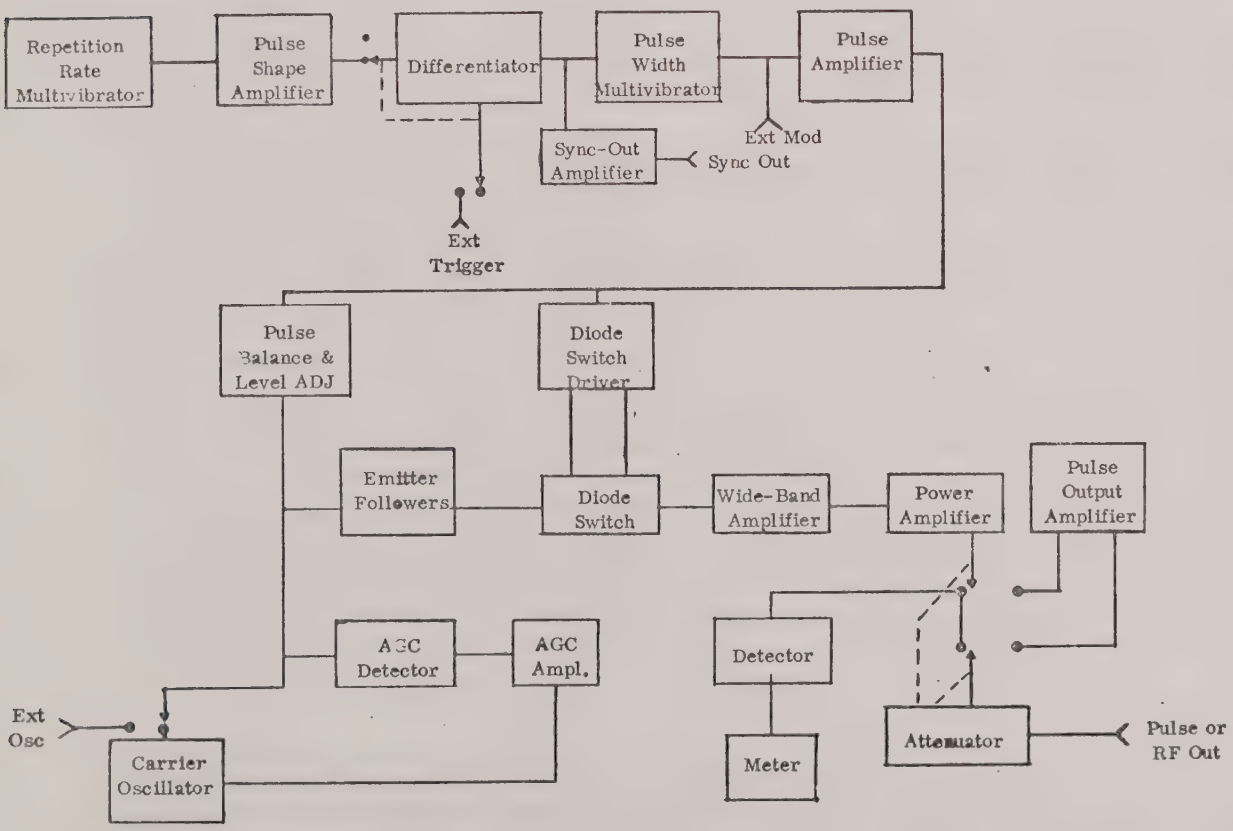


FIG. 3.1 BLOCK DIAGRAM

SECTION IV

MAINTENANCE

4.1 ALIGNMENT PROCEDURE

Equipment Necessary

a. Sweep generator
b. CW oscillator
c. Oscilloscope
d. Frequency Counter
e. VTVM
f. External Detector
g. RF MIXER
h. Fractional Attenuator

A. POWER SUPPLY

NOTE: Test points for reading the power supply voltages are provided on the left rear corner of the amplifier box:

1. Using a VTVM, read between the +20 V test point and chassis ground and adjust the +20 V ADJ (R-113) for +20 V.
2. Using a VTVM, check the +11 V test point for +11 V (-.5, +1.5 V).
3. Repeat Step 2 checking the -11 V test point for -11 V (-.5, +1.5 V).

B. PULSE REPETITION RATE

1. Using the output from the SYNC output jack, interconnect the 5070-B with and oscilloscope. An event counter may be used in place of the oscilloscope if one is available.
2. Place the 5070-B in the PULSED RF mode.
3. Adjust the pulse width controls for a 5 μ sec. width.
4. Using the PULSE RATE switch, check each range. See that the front panel RATE ADJ pot provides sufficient adjustment on each range.
5. The RATE RANGE pot (R-203 on Pulse Generator board) may be adjusted if the front panel controls do not provide sufficient range.

C. PULSE WIDTH

1. Place the function selector switch in the + VIDEO PULSE position.
2. Adjust the repetition rate controls for the maximum rep rate.
3. Using the PULSE or RF OUT jack, connect the 5070-B to the oscilloscope using 50 ohm cable properly terminated.
4. Select the shortest pulse width range and see that the fine WIDTH ADJ covers this range.
5. If the range is not correct, trimmer C-53 may be adjusted to set the .1-1 ns range.

D. RF AMPLIFIER ALIGNMENT

1. Disconnect the 3" coaxial cable from the RF amplifier box.
2. Set the FUNCTION switch to the CW position.

3. Feed a 5 to 130 MHz swept frequency into the RF amplifier. This signal should be from a 50Ω source and approximately .9 V p/p.
4. Use the horizontal output from the sweep generator to drive the horizontal circuits of the oscilloscope.
5. The output of the 5070-B should be run thru an RF detector and into the vertical circuits of the oscilloscope.
6. Turn the RF or PULSE LEVEL control to maximum. An output of .5 V rms should be observed; if not, adjust the sweep generator output slightly.
7. Insert a fractional attenuator in the test system between the RF output and the oscilloscope.
8. Switch in .5 DB and note the level of the output.
9. Switch out the .5 DB and ascertain that the output is flat within the limits of ±.5 DB,
10. Maximum flatness may be obtained by adjusting trimmer C-33 and coil L-9 (located in the RF amplifier box).
11. R-44 may be selected to compensate for the high frequency end of the response. Increase the value of the resistor to raise the high end and decrease it to lower the high end.
12. Reconnect the 3" coaxial cable.

E. RF OUTPUT AND METER ADJUSTMENT

1. Switch the FUNCTION SELECTOR to the CW position.
2. The PULSE RATE selector may be set at any position except EXT. MOD.
3. Interconnect the 5070-B with an oscilloscope so that the output may be observed.
4. Adjust the AGC ADJ control (R-97) for a 1.5 V p/p output waveshape.
5. Now feed the output thru an RF detector and into an oscilloscope.
6. Adjust the METER ADJ pot (R-69) for a .5 V reading on the front panel meter.
7. Vary the FREQUENCY control through its range and observe the DC output. Trimmer C-75 may be adjusted to compensate any large deviations at the higher frequencies.
8. Now switch in 3 DB of fixed attenuation and note the output level.
9. Switch out 3 DB of fixed attenuation and turn the RF or PULSE LEVEL control down until the output equals the reference established in Step 10.
10. Repeat the entire procedure until any interaction of controls is eliminated.

F. PULSED RF OUTPUT

1. Set the 5070-B controls as follows:

FUNCTION SELECTOR	CW
PULSE RATE	EXT MOD
PULSE WIDTH	1 μs
BAND SELECTOR	EXT OSC

2. Connect the RF output to an oscilloscope.
3. Use BALANCE ADJ (R-34) and BIAS ADJ (R-79) to adjust for minimum observed "spikes" on the output.
4. Note the level of the output, this will correspond to the "OFF" level.
5. Place the PULSE RATE switch in the 5 KHz position. Switch in fixed attenuation until

the output equals the level established in Step 4. BALANCE ADJ (R-34) is adjusted for maximum "OFF" level.

6. Switch the FUNCTION SELECTOR to the PULSED RF position and the BAND SELECTOR to the 10-24 MHz position.
7. Observe the shaping of the pulses; if the pulse has a slow rise time, C-15 (in the RF amplifier) may be selected to improve it. The PULSED RF ON LEVEL ADJ (R-86) may be adjusted to obtain a sharp "lagging" edge.

G. RF HEAD ALIGNMENT

1. Set the 5070-B FUNCTION SELECTOR to the CW position.
2. Using the BAND SELECTOR coarse control, select the lowest band of frequencies.
3. Connect the RF output of the 5070-B to the input of an RF mixer. Feed the output of a signal generator into the other input of the mixer. The mixer output is connected to the input of an oscilloscope.
4. Note the level of the output, this will correspond to the "OFF" level.
5. Vary the fine tune control on the BAND SELECTOR until a "zero beat" is visible on the oscilloscope.
6. If the low frequency cannot be obtained, remove the teflon coil assembly from the turret and spread or compress the coils as necessary.
7. Adjust the signal generator for the highest frequency of the selected band.
8. If the high frequency cannot be obtained, remove the teflon coil assembly and adjust the two slugs.

   NOTE: Adjust the slugs an equal amount; if not the output waveshape may appear distorted.

9. Repeat the above procedure for each band.

4.2 RESHIPMENT INSTRUCTIONS

If it is necessary to return the 5070-B to the factory for repair or calibration, it is suggested that the instrument be securely padded and packaged to prevent damage during shipping. A packing slip identifying the shipper, as well as the instrument type and serial number is also helpful. A statement indicating the particular malfunction may be included for the benefit of the factory service personnel.

4.3 PARTS REPLACEMENT

When making repairs on the 5070-B, exact replacement parts are suggested to insure satisfactory performance. These are available from the Kay Electric Co. When ordering parts please specify the instrument type, serial number, Kay drawing number and the Kay part number.

CAPACITORS: (All capacitors in μμf, 500 volts, unless otherwise indicated)

DWG. SYMBOL NO.	DESCRIPTION	KAY PART NO.	MANUFACTURER & PART NO.
C1	300, Silver Mica	6359-64	Elmenco Dm15-301
C2	.02μf, 75V, Ceramic Disc	6360-23	Gulton MIN-V-.02-Z
C3 & C4	4000, Ceramic Feed Thru	6356-5	Erie X5V2443-40000GMV
C5	470, 1KV, Ceramic Disc	6360-11	RMC B470GMV
C6	5, Silver Mica	6359-52	Elmenco DM15-050
C7 & C8	3.5 - 31.5, Variable	8337	Kay Electric Co.
C9	5, Silver Mica	6359-52	Elmenco DM15-050
C10	470, 1KV Ceramic Disc	6360-11	RMC B470GMV
C11 & C12	4000, Ceramic Feed Thru	6356-5	Erie X5V2443-4000 GMV
C13	.01μf, Ceramic Disc	6360-6	Sprague CK63AW103M
C14	4000, Ceramic Feed Thru	6356-5	Erie X5V2443-4000 GMV
C15	2, Silver Mica	6359-50	Elmenco DM15-020
C16	300, Silver Mica	6359-64	Elmenco DM15-301
C17	4000, Ceramic Feed Thru	6356-5	Erie X5V2443-4000 GMV
C18	.05μf, 100V, Mylar-Paper	6899-1	Elmenco 1DP-2-503
C19	4000, Ceramic Feed Thru	6356-5	Erie X5V2443-4000 GMV
C20	.22μf, 50V, Mylar	6411-1	Goodall 601PE 84411
C21	.001μf, 600V, Mylar-Paper	6899-10	Elmenco 6DP-1-102
C22 & C23	4000, Ceramic Feed Thru	6356-5	Erie X5V2443-4000GMV
C24	.22μf, 50V, Mylar	6411-1	Goodall 601PE 84411
C25	200, Silver Mica	6359-63	Elmenco DM15-201
C26	4000, Ceramic Feed Thru	6356-5	Erie X5V2443-4000GMV
C27	.22μf, 50V, Mylar	6411-1	Goodall 601PE 84411
C28	200, Silver Mica	6359-63	Elmenco DM15-201
C29	3, Ceramic Feed Thru	1996	CTC #1990
C30	4000, Ceramic Feed Thru	6356-5	Erie X5V2443-4000GMV
C31	100μf, 6V, Electrolytic	6355-109	Sprague 40D107006DP0
C32	120, Silver Mica	6359-73	Elmenco DM15-121
C33	7-45, Ceramic Trimmer	6358-7	Erie 503000 D2PO 33R
C34	22μf, 15V, Electrolytic	6355-84	Texas SCM226BP015D2
C35	4000, Ceramic Feed Thru	6356-5	Erie X5V2443-4000GMV
C36	22μf, 15V, Electrolytic	6355-84	Texas SCM226BP015D2
C37	.05μf, 100V, Mylar-Paper	6899-1	Elmenco 2DP-2-503
C38	300, Silver Mica	6359-64	Elmenco DM15-101
C39	4000, Ceramic Feed Thru	6356-5	Erie X5V2443-4000GMV
C40	15, Silver Mica	6359-55	Elmenco DM15-150
C41	.01μf, Ceramic Disc	6360-6	Sprague CK63AW103M
C42	90μf, 6V, Non Polarized	6355-117	Kemet 65268SU
C43	47μf, 25V, Electrolytic	6355-127	G.E. 76F02KK470
C44	22μf, 15V, Electrolytic	6355-84	Texas SCM226BP015D2
C45	4000, Ceramic Feed Thru	6356-5	Erie X5V2443-4000GMV
C46	FACTORY SELECTED	--------	----------
C47	150μf, 15V, Electrolytic	6355-118	Sprague 40D157F015DH3
C48 & C49	1000, Ceramic Feed Thru	6356-4	Erie X5V2443-1000GMV
C50	4000, Ceramic Feed Thru	6356-5	Erie X5V2443-4000GMV
C51	22μf, 15V, Electrolytic	6355-84	Texas SCM226BP015D2
C52 & C53	7-45, Ceramic Trimmer	6358-7	Erie 503000 D2P0 33R
C54	68, Silver Mica	6359-84	Elmenco DM15-680
C55	.01μf, 100V, Mylar-Paper	6899-12	Elmenco 1DP-1-103
C56	.001μf, 600V, Mylar-Paper	6899-10	Elmenco 6DP-1-102
C57	200, Silver Mica	6359-63	Elmenco DM15-201
C58	.1μf, 100V, Mylar-Paper	6899-11	Elmenco 1DP-2-104
C59 & C60	.82μf, 35V, Electrolytic	6355-116	Kemet KR82J35K5
C61	.1μf, 100V, Mylar-Paper	6899-11	Elmenco 1DP-2-104
C62	.2μf, 75V, Ceramic Disc	6360-9	Gulton MIN-V-.2-Z
C63	1000μf, 50V, Electrolytic	6355-79	Sprague TVL-1338
C64	25μf, 25V, Electrolytic	6355-78	Sprague 40D256F025DD3
C65	250μf, 25V, Electrolytic	6355-47	Cornell Dubilier BR250-25
C66	50μf, 25V, Electrolytic	6355-59	Cornell Dubilier BR50-25
C67	250μf, 50V, Electrolytic	6355-72	Cornell Dubilier BR250-50
C68	22μf, 35V, Electrolytic	6355-135	Texas Type SCM
C69	2.2μf, 50V, Electrolytic	6355-128	G.E. 76F026C2R2
C70	33μf, 25V, Electrolytic	6355-122	G.E. 76F02KF330
C71	1000μf, 50V, Electrolytic	6355-79	Sprague TVL-1338
C72	25μf, 25V, Electrolytic	6355-78	Sprague 40D256F025DD3
C73	250μf, 25V, Electrolytic	6355-47	Cornell Dubilier BR250-25
C74	50μf, 25V, Electrolytic	6355-59	Cornell Dubilier BR50-25
C75	.05μfd, 100V, Mylar-Paper	6899-1	Elmenco 1DP-2-503

DIODES:

D1 thru D12	1N82A, Germanium	6357-38	Sylvania 1N82A
D13 thru D18	F6, Silicon	6357-3	Sarkes Tarzian F6
D19	1N4742, Zener	6357-107	Motorola 1N4742
D20	1N461, Zener	6357-57	Motorola 1N461
D21	1N4736, Zener	6357-98	Motorola 1N4736
D22	1N936, Zener	6357-106	Motorola 1N936
D23	F6, Silicon	6357-3	Sarkes Tarzian F6
D24	1N4742, Zener	6355-107	Motorola 1N4742
F1	Fuse, 3 Amp Slow-Blow	6908-7	Littlefuse 313003
I1	Lamp, Bayonet, #44	249-44	General Electric #44

CONNECTORS:

J1	UG625/U, Coax	6909-81	Dage, UG625/U
J2	UG291A/U, Coax	6909-25	Dage, UG291A/U
J3 thru J6	UG625/U, Coax	6909-81	Dage, UG625/U
J7	UG185/U, Coax	6909-77	Dage, UG185/U
J8	UG625/U, Coax	6909-81	Dage, UG625/U
J9	UG535/U, Coax	6909-80	Dage, UG535/U

COILS:

L1	Special, Slug-Tuned	L1-9846D	Kay Electric Company
L2	Special, Slug-Tuned	L2-9846D	Kay Electric Company
L3	Special, Slug-Tuned	L3-9846D	Kay Electric Company
L4	Special, Slug-Tuned	L4-9846D	Kay Electric Company
L5	Special, Slug-Tuned	L5-9846D	Kay Electric Company
L6	Special, Slug-Tuned	L6-9846D	Kay Electric Company
L7 & L8	12μh, choke	6394-1	Jeffers 4421-8K
L9	Special, Slug-Tuned	L9-9846D	Kay Electric Company
L10 & L11	12μh, choke	6394-1	Jeffers 4421-8K
M1	Meter, 0-.5V RMS	8050	Kay Electric Co.

PLUGS:

P1	AC Line cord w/plug	7166-2	Beldon BG562
P2 thru P4	NOT USED	--------	----------
P5 thru P7	UG88/U, Coax	6909-76	Dage, UG88/U
P8	NOT USED	--------	----------
P9	UG88/U, Coax	6909-76	Dage, UG88/U

TRANSISTORS:

Q1 & Q2	2N3866 (5)	K170-5	Vector 2N3866
Q3 & Q4	NOT USED	--------	----------
Q5	2N2270	K132	RCA 2N2270
Q6	NOT USED	--------	----------
Q7	2N3566	K159	Fairchild 2N3566
Q8	2N2270	K132	RCA 2N2270
Q9	MM1941	K157	Motorola MM1941
Q10	2N1141	K127	Motorola 2N1141
Q11	2N2270	K132	RCA 2N2270
Q12 & Q13	2N3568	K187	Fairchild 2N3568
Q14 & Q15	2N3866 (6)	K170-6	Vector 2N3866
Q16	2N1141 (5)	K127-5	Motorola 2N1141
Q17	2N3866 (6)	K170-6	Vector 2N3866
Q18	2N1141 (4)	K-127-4	Motorola 2N1141
Q19	2N3568	K187	Fairchild 2N3568
Q20 & Q21	2N1701	K140	RCA 2N1701
Q22	2N1183	K123	RCA 2N1183

RESISTORS: (Unless otherwise specified, all components are fixed are fixed composition, ½ watt, 10% tolerance.)

R1 thru R4	NOT USED	--------	----------
R5	100	1011-C	Allen Bradley CB1011
R6	NOT USED	--------	----------
R7 & R8	10, ½ watt	1001-E	Allen Bradley EB1001
R9	100	1011-C	Allen Bradley CB1011
R10	10K	1031-C	Allen Bradley CB1031
R11	68	6801-C	Allen Bradley CB6801

R12	2.2K	2221-C	Allen Bradley CB2221
R13	68	6801-C	Allen Bradley CB6801
R14	2.2K	2221-C	Allen Bradley CB2221
R15	10K	1031-C	Allen Bradley CB1031
R16	100	1011-C	Allen Bradley CB1011
R17 & R18	220	2211-C	Allen Bradley CB2211
R19	47	4701-C	Allen Bradley CB4701
R20	1.8K	1821-C	Allen Bradley CB1821
R21	18	1801-C	Allen Bradley CB1801
R22 & R23	220	2211-C	Allen Bradley CB2211
R24	10, ½ watt	1011-E	Allen Bradley EB1011
R25	470	4711-C	Allen Bradley CB4711
R26	2.7, ½ watt, 5% tol.	2P75-E	Allen Bradley EB27G5
R27	390	3911-C	Allen Bradley CB3911
R28	10, ½ watt	1001-E	Allen Bradley EB1001
R29	2.7, ½ watt, 5% tol.	2P75-E	Allen Bradley EB27G5
R30	820	8211-C	Allen Bradley CB8211
R31	100	1011-C	Allen Bradley CB1011
R32	10	1001-C	Allen Bradley CB1001
R33	1K, ½ watt	1021-E	Allen Bradley EB1021
R34	250, ½ watt, pot. Var.	9122-98	CTS RA3806
R35 & R36	220	2211-C	Allen Bradley CB2211
R37	100	1011-C	Allen Bradley CB1011
R38	820	8211-C	Allen Bradley CB8211
R39	3.9K	3921-C	Allen Bradley CB3921
R40	2.7, ½ watt, 5% tol.	2P75-E	Allen Bradley EB27G5
R41	10, ½ watt	1001-E	Allen Bradley EB1001
R42	2.7, ½ watt, 5% tol.	2P75-E	Allen Bradley EB2P75
R43	680	6811-C	Allen Bradley CB6811
R44	FACTORY SELECTED	--------	----------
R45	47	4701-C	Allen Bradley CB4701
R46	100	1011-C	Allen Bradley CB1011
R47	100, 2 watt, pot., var.	9122-4	Allen Bradley JA2N048S101UE
R48	220	2211-C	Allen Bradley CB2211
R49	820	8211-C	Allen Bradley CB8211
R50 & R51	47	4701-C	Allen Bradley CB4701
R52	33	3301-C	Allen Bradley CB3301
R53	FACTORY SELECTED	--------	----------
R54	1.8K	1821-C	Allen Bradley CB1821
R55	10, ½ watt	1001-E	Allen Bradley EB1001
R56	180, ½ watt	1811-E	Allen Bradley EB1811
R57	27	2701-C	Allen Bradley CB2701
R58	18	1801-C	Allen Bradley CB1801
R59	100	1011-C	Allen Bradley CB1011
R60	2.7, ½ watt, 5% tol.	2P75-E	Allen Bradley EB27G5
R61	51, 1 watt	5101-G	Allen Bradley GB5101
R62	FACTORY SELECTED	---------	----------
R63	680	6811-C	Allen Bradley CB6811
R64	3.3K	3321-C	Allen Bradley CB3321
R65	390	3911-C	Allen Bradley CB3911
R66	15	1501-C	Allen Bradley CB1501
R67	FACTORY SELECTED	--------	----------
R68	3K	3021-C	Allen Bradley CB3021
R69	2K, 2 watt pot, var.	9122-22	Allen Bradley JA2N048S202UE
R70	50K, 2 watt pot, var.	9122-44	Allen Bradley JA2N048S503UE
R71	39K	3931-C	Allen Bradley CB3931
R72	2.7, ½ watt, 5% tol.	2P75-E	Allen Bradley EB2P75
R73	10, ½ watt	1001-E	Allen Bradley EB1001
R74	1, 8K, ½ watt	1821-E	Allen Bradley EB1821
R75	390, ½ watt	3911-E	Allen Bradley EB3911
R76	68	6801-C	Allen Bradley CB6801
R77	15K, 2 watt, pot, var.	9122-86	Allen Bradley JA2N048S153UE
R78	2.7K, ½ watt	2721-E	Allen Bradley EB2721
R79	10K, 2 watt, pot, var.	9122-31	Allen Bradley JA2N048S103UE
R80	3K, ½ watt	3021-E	Allen Bradley EB3021
R81	1.8K, ½ watt	1821-E	Allen Bradley EB1821
R82	5K, ½ watt, pot, var.	9122-92	CTS PH4911
R83	1.2K, ½ watt	1221-E	Allen Bradley EB1221
R84	1K, ½ watt, pot, Var.	9122-99	CTS PH1910
R85 A & B	25K, 2 watt, Dual pot	9122-41	Allen Bradley JD2N048S253UE
R86 & R87	50, 2 watt pot, var.	9122-1	Allen Bradley JA2N048S500UE
R88	22K, ½ watt	2231-E	Allen Bradley EB2231
R89	1K, ½ watt	1021-E	Allen Bradley EB1021
R90	470, ½ watt	4711-E	Allen Bradley EB4711

R91	8, 2K, ½ watt	8221-E	Allen Bradley EB8221
R92	9, 1K, ½ watt, 5% tol.	9125-E	Allen Bradley EB9125
R93 & R94	20K, ½ watt	2031-E	Allen Bradley EB2031
R95	10, ½ watt	1001-E	Allen Bradley EB1001
R96	10K, ½ watt	1031-E	Allen Bradley EB1031
R97	500, 2 watt pot, var.	9122-16	Allen Bradley JA2N048S501UE
R98	1K, ½ watt	1021-E	Allen Bradley EB1021
R99	2.2K, ½ watt	2221-E	Allen Bradley EB2221
R100	100, ½ watt	1011-E	Allen Bradley EB1011
R101	5, 5 watt, w/w	9292-22	Ward Leonard 5XM5WL
R102	390, 1 watt	3911-G	Allen Bradley GB3911
R103	240, 1 watt	2411-G	Allen Bradley GB2411
R104	20, 10 watt w/w	9292-23	Ward Leonard 10X20
R105	10, 2 watt	1000-H	Allen Bradley HB1001
R106	27K, ½ watt	2731-E	Allen Bradley EB2731
R107	2.2K, ½ watt	2221-E	Allen Bradley EB2221
R108	5.6K, ½ watt	5621-E	Allen Bradley EB5621
R109	1.2K, ½ watt	1221-E	Allen Bradley EB1221
R110	3.3K, ½ watt	3321-E	Allen Bradley EB3321
R111	3.9, ½ watt, 5% tol.	3P95-E	Allen Bradley EP39G5
R112	2.7K, ½ watt	2721-E	Allen Bradley EB2721
R113	1K, 2 watt pot, var.	9122-20	Allen Bradley JA2N048S102UE
R114	2.7K, ½ watt	2721-E	Allen Bradley EB2721
R115	10, 5 watt, w/w	9292-21	Ward Leonard 5X10
R116 & R117	91, 1 watt	9101-G	Allen Bradley GB9101
R118	5, 5 watt	9292-22	Ward Leonard 5XM5W6
R119	470	4711-C	Allen Bradley CB4711
R120	2.7, ½ watt, 5% tol.	2P75-E	Allen Bradley EB27G5

SWITCHES:

S1 A thru D	Rotary, 4 wafer, 5 position	9772	Kay Electric Co.
S1E	Toggle, DPDT	254-TX	Kay Electric Co.
S2	Rotary, 3 wafer, 4 position	8310	Kay Electric Co.
S3	Rotary, 2 wafer, 3 position	8311	Kay Electric Co.
S4	Rotary, Turret	8309	Kay Electric Co.
T1	Transformer, power	8336	Kay Electric Co.

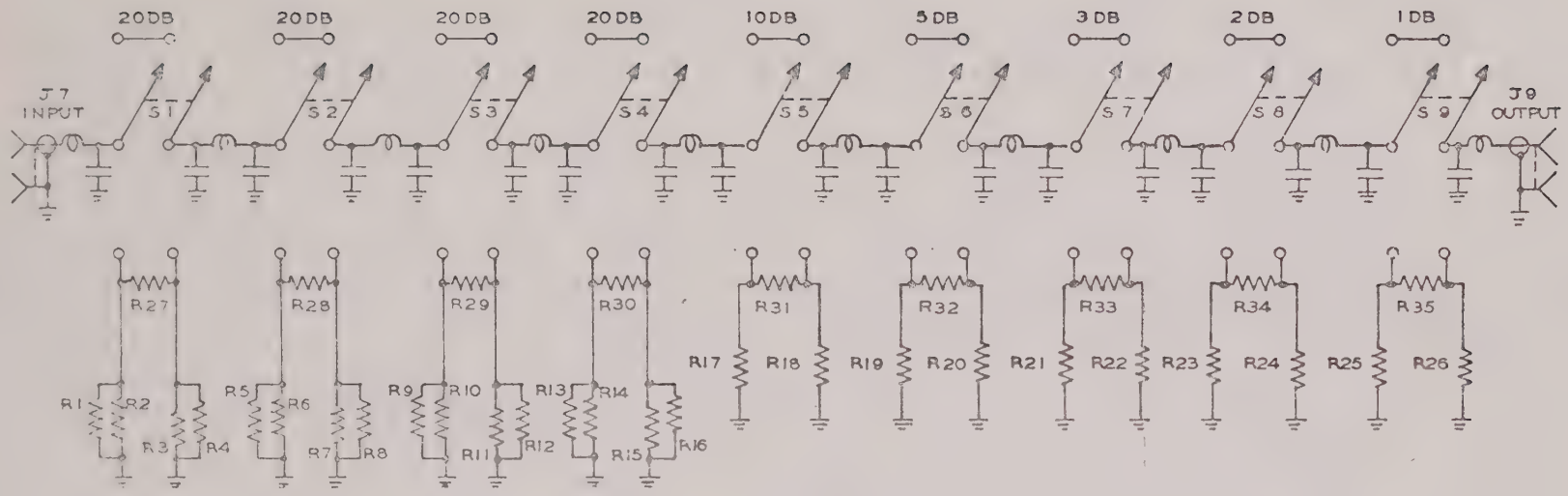
PARTS LIST, P. C. BOARD C8039-2

DWG. SYMBOL NO.	DESCRIPTION	KAY PART NO.	MANUFACTURER & PART NO.
CAPACITORS: (All capacitors in $\mu\mu$f, 500 volts, unless otherwise indicated)			
C201	.01μfd, 100V, Mylar-Paper	6899-12	Elmenco 1DP-1-103
C202	NOT USED	-------	----------
C203	NOT USED	-------	----------
C204	NOT USED	-------	----------
C205	NOT USED	-------	----------
C206	.001μfd, 600V, Mylar-Paper	6899-10	Elmenco 6DP-1-102
C207	50, Silver Mica	6359-60	Elmenco DM15-500
C208	.02μfd, 100V, Mylar-Paper	6899-13	Elmenco 1DP-1-203
C209	.01μfd, 100V, Mylar-Paper	6899-12	Elmenco 1DP-1-103
C210	50, Silver Mica	6359-60	Elmenco DM15-500
C211	.02μfd, 100V, Mylar-Paper	6899-13	Elmenco 1DP-1-203
C212	.01μfd, 100V, Mylar-Paper	6899-12	Elmenco 1DP-1-103
C213	500, Silver Mica	6359-66	Elmenco DM15-501
C214	500, Silver Mica	6359-66	Elmenco DM15-501
C215	10, Silver Mica	6359-60	Elmenco DM15-100
C216	5, Silver Mica	6359-52	Elmenco DM15-050
C217	.01μfd, 100V, Mylar-Paper	6899-12	Elmenco 1DP-1-103
C218	120, Silver Mica	6359-46	Elmenco DM15-121
C219	.1μfd, 100V, Mylar-Paper	6899-11	Elmenco 1DP-2-104
DIODES:			
D201	Diode, Germanium, 1N126A	6357-19	Erie 1801 ED 1N126A
D202	Diode, Germanium, 1N456	6357-95	General Instrument
D203	Diode, Germanium, 1N126A	6357-19	Erie 1801 ED 1N126A
D219	Diode, Germanium, 1N126A	6357-19	Erie 1801 ED 1N126A
TRANSISTORS:			
Q201	Transistor 2N2614	K149	RCA 2N2614
Q202	Transistor 2N2614	K149	RCA 2N2614
Q203	Transistor 2N961	K152	Motorola 2N961

Q204	Transistor 2N961	K152	Motorola 2N961
Q205	Transistor 2N961	K152	Motorola 2N961
Q206	Transistor 2N961	K152	Motorola 2N961
Q207	Transistor 2N965	K150	Motorola 2N965
Q208	Transistor 2N706A	K154	Motorola 2N706A

RESISTORS:

R201	22, $\frac{1}{4}$ watt	2201-C	Allen Bradley CB2201
R202	470, $\frac{1}{2}$ watt	4711-E	Allen Bradley EB4711
R203	5K, 1 watt, pot., w/w	9122-27	IRC Type 100-1
R204	NOT USED	-------	----------
R205	470, $\frac{1}{2}$ watt	4711-E	Allen Bradley EB4711
R206	2.2K, $\frac{1}{4}$ watt	2221-C	Allen Bradley CB2221
R207	22, $\frac{1}{4}$ watt	2201-C	Allen Bradley CB2201
R208	1K, $\frac{1}{4}$ watt	1021-C	Allen Bradley CB1021
R209	15K, $\frac{1}{4}$ watt	1531-C	Allen Bradley CB1531
R210	22, $\frac{1}{4}$ watt	2201-C	Allen Bradley CB2201
R211	680, $\frac{1}{2}$ watt	6811-E	Allen Bradley EB6811
R212	100, $\frac{1}{4}$ watt	1011-C	Allen Bradley CB1011
R213	270, $\frac{1}{4}$ watt	2711-C	Allen Bradley CB2711
R214	68K, $\frac{1}{4}$ watt	6831-C	Allen Bradley CB6831
R215	10, $\frac{1}{4}$ watt	1001-C	Allen Bradley CB1001
R216	390, $\frac{1}{4}$ watt	3911-C	Allen Bradley CB3911
R217	22, $\frac{1}{4}$ watt	2201-C	Allen Bradley CB2201
R218	NOT USED	------	----------
R219	470, $\frac{1}{2}$ watt	4711-E	Allen Bradley EB4711
R220	470, $\frac{1}{4}$ watt	4711-C	Allen Bradley EB4711
R221	47K, $\frac{1}{4}$ watt	4731-C	Allen Bradley CB4731
R222	680, $\frac{1}{2}$ watt	6811-E	Allen Bradley EB6811
R223	680, $\frac{1}{4}$ watt	6811-C	Allen Bradley CB6811
R224	NOT USED	-------	----------
R225	470, $\frac{1}{4}$ watt	4711-C	Allen Bradley CB4711
R226	12K, $\frac{1}{2}$ watt	1231-E	Allen Bradley EB1231
R227	22, $\frac{1}{4}$ watt	2201-E	Allen Bradley EB2201
R228	220, 1 watt	2211-G	Allen Bradley GB2211
R229	270, $\frac{1}{4}$ watt	2711-E	Allen Bradley EB2711
R230	1.2K, $\frac{1}{4}$ watt	1221-C	Allen Bradley CB1221
R231	NOT USED	-------	----------
R232	220, 1 watt	2211-G	Allen Bradley GB2211
R233	NOT USED	-------	----------
R234	NOT USED	-------	----------
R235	1.2K, $\frac{1}{4}$ watt	1221-C	Allen Bradley CB1221

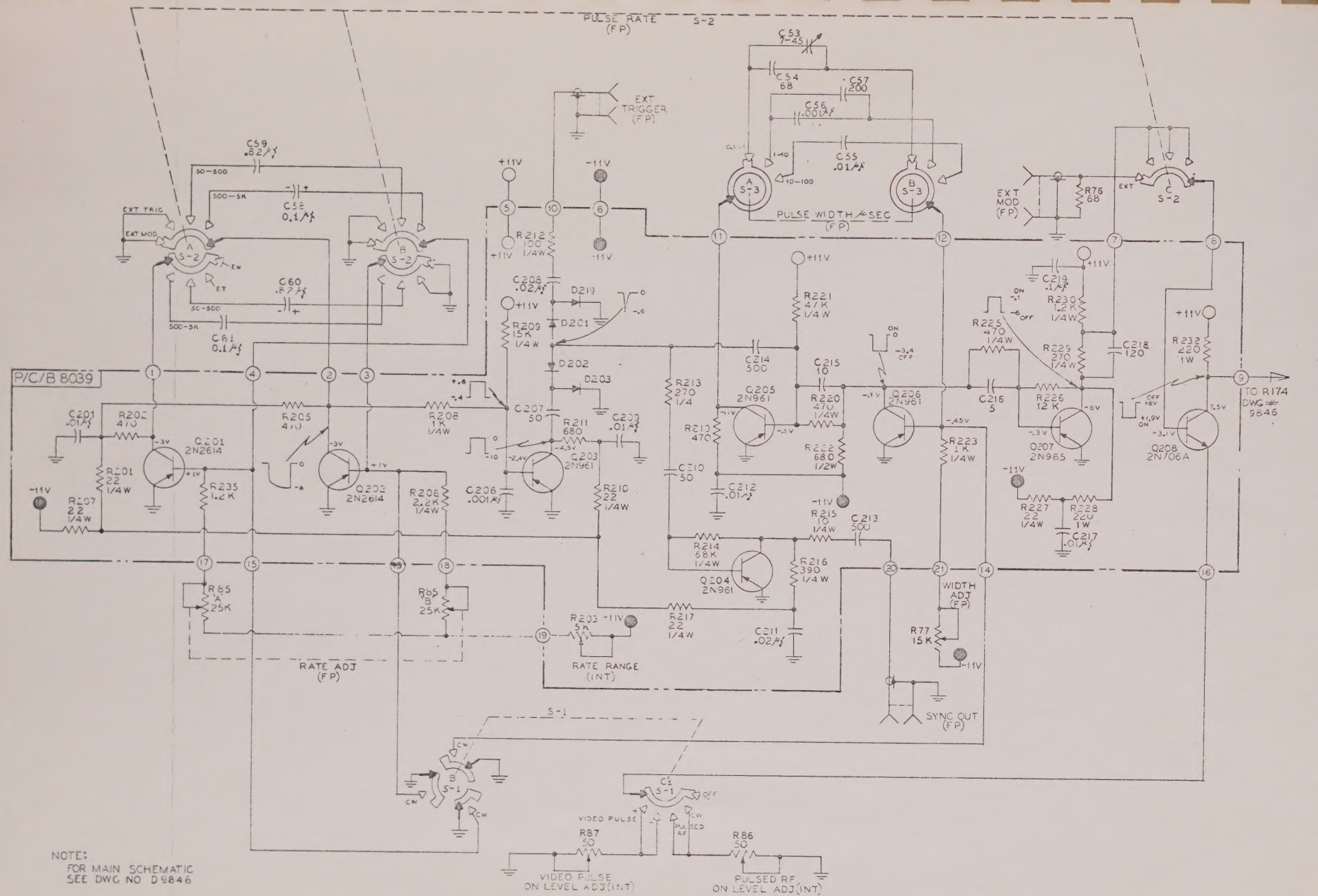


PART OF MAIN SCHEMATIC -#D9846
USED WITH RADA-PULSER 5070 A&B

2090475-0895

$ 12.00

DWG. NO. A-10771A



NOTE:
FOR MAIN SCHEMATIC
SEE DWG NO D9846

NOTE: UNLESS INDICATED OTHERWISE
ALL RESISTANCES ARE IN OHMS 1/4W
ALL CAPACITANCE ARE IN μf
(2) INDICATES EGRESS HOLES
(FP) INDICATES FRONT PANEL

P/C/B SCHEMATIC **DWG. NO.** C 8039 B

92344